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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/735,247	12/12/2003	Stephen Arnold	Poly-48APP	9808

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EXAMINER	
SODERQUIST, ARLEN	
ART UNIT	PAPER NUMBER
1797	
MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/735,247	ARNOLD ET AL.	
	Examiner	Art Unit	
	Arlen Soderquist	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 January 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12-12-03,4-22-05,1-2-08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. Applicant's election of Group I in the reply filed on January 2, 2008 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

2. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

3. This application repeats a substantial portion of prior Application No. 10/096,333, filed March 2, 2002, and adds and claims additional disclosure not presented in the prior application. Since this application names an inventor or inventors named in the prior application, it may constitute a continuation-in-part of the prior application. Should applicant desire to obtain the benefit of the filing date of the prior application, attention is directed to 35 U.S.C. 120 and 37 CFR 1.78.

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 2 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the limitations of claim 3, does not reasonably provide enablement for any method of compensating the change in the transmission of light due to a factor other than absorption of light by a method other than as claimed in claim 3. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with this claim. The specification does not teach any other method of removing common-mode noise than through the use of a second microsphere that is not coated with the receptor.

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Arnold (US 2004/0137478). In the figures, figure 9 shows a flow chart that includes steps that clearly anticipate the steps of claim 1.

The applied reference has a common assignee and common inventors with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

8. Claims 1-3 are rejected under 35 U.S.C. 102(e) as being anticipated by Arnold (US 2003/0174923). Claims 1 and 6-7 appear to be identical with claims 1-3 of the instant application. Additionally figures 14-15 teach steps which clearly anticipate the instant method steps.

The applied reference has a common assignee and common inventors with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

9. Claim 1 is rejected under 35 U.S.C. 102(a,e) as being clearly anticipated by Maleki (US 2002/0097401). In the published application Maleki teaches a method of optical sensing based on a whispering-gallery mode resonator. Paragraph [0006] teaches that the disclosure includes optical sensing methods based on whispering-gallery-mode (WGM) micro resonators. An optical probe beam is evanescently coupled into at least one whispering gallery mode of such a

resonator. A sample material to be measured may be surrounded outside the resonator to interact with and modify the whispering gallery mode or geometry of the resonator. The evanescent field outside the resonator is detected or measured to detect a change caused by the modification. This change is then processed to extract information about the sample material. This change may be reflected as, e.g., a temporal change in the mode structure during a transient period, attenuation in the evanescent field, a frequency shift in the whispering gallery mode and its evanescent field, or a change in efficiency of the evanescent coupling of the probe beam into the resonator or coupling of the energy in the whispering gallery mode out of the resonator. Figure 1 shows a micro whispering-gallery-mode resonator formed of a dielectric sphere with a symmetric axis (101). The micro resonator (100) generally may be formed from at least a portion of a whole dielectric sphere that includes the equator (110) of the sphere. Such a spherical resonator can support a special set of resonator modes known as "whispering gallery modes" which are essentially electromagnetic field modes confined in an interior region close to the surface of the sphere around its equator and circulating by total internal reflection inside the axially symmetric dielectric body. Figure 2 shows an optical sensing device (200) by using a micro WGM resonator (201). An evanescent coupler (210) is used to couple an input beam (214) from a light source (220) to the resonator via an evanescent field (212). The coupler may also couple energy out of the resonator to produce an output optical signal (216). An optical detection module (230) is used to receive and detect the signal to produce a detector signal (232). A signal processing module (240) processes the signal to produce the desired measurement of the sample. The processing module may include a microprocessor to process and infer the desired property of the sample from the information in the detector signal. Figure 3 shows several ways of coupling the light into the microresonator. The basic operation of the device is illustrated by the flowchart in figure 4. A sample to be measured is introduced to be present in the reach of WGM field of the resonator (outside the resonator). The sample can interact with the WGM field to produce a change in the output signal when compared to the output signal in absence of the sample. This change, therefore, can be used to extract information on a desired property of the sample. Paragraph [0041] teaches that a number of mechanisms based on monitoring optical attenuation or subtle changes in the refractive index may be utilized to detect the presence of a substance producing these changes. These include atoms and molecules with chemical or

biological origin. For example, as an analyte interacts with the surface, it causes a change in the mode structure (i.e. light storage properties) due to a change in the index of refraction, or light coupling strength, or change in the geometric size of the optical resonator. If the surface can be treated in a way so as to bind specific analytes, then the changes in the mode structure can be used to measure analyte binding. Paragraph [0045] teaches that an optical sensor based on a WGM microresonator can be designed to respond to specific analytes by adding a surface coating on the exterior surface of the resonator that binds to a specific substance or analyte. Examples of such coatings include but are not limited to, immunosensors, proteins, DNA, polysaccharides, metal complexes, molecularly imprinted polymers or polymers that swell when exposed to chemicals, or any other coating sensitive to presence of certain analytes. Paragraphs [0049] to [0052] teach that in the measurements, the observed signal includes a temporal change in the whispering gallery mode spectrum. Such changes may include, but are not limited to, a shift of the mode structure, change of relative amplitudes of different modes and change in shape of specific resonances. The temporal shift of the mode structure is due to the temporal change in the geometry of the sensitive region which is located on the resonator, the coupler, or both. The geometry changes upon adsorption of analyte from solution thereby changing effective radius of the resonator in case of coated resonator or changing effective gap between resonator and coupler which is coated with a layer to bind a specific substance. The change of the radius of the resonator will be manifested in the shift of the mode structure in the frequency domain. The quality factor of particular resonance will not necessarily be changed. Therefore, tracking the shift of modes with time provides a sensitive measurement directly related to changes in the geometry of the resonator. The change in the measured signal due to the introduction of the sample may be measured to two different ways. Figure 7 shows three different periods with respect to introducing the sample to the sensing WGM resonator at time T1. The first period is before the sample is introduced and the sensing WGM resonator reaches an equilibrium state in absence of the sample. The second period is an initial transient period between T1 and T2 at which the resonator reaches a different equilibrium state after the sample is introduced. The third period is after the time T2 where the resonator reaches the different equilibrium state. The two different measured values of a selected characteristic property of the resonator may be respectively measured during the first and the third periods, such as the Q factor, the mode

frequency, or the mode coupling efficiency. However, the two values may also be measured during the transient period when the resonator is in a non-equilibrium state due to the introduction of the sample. The temporal change of a selected characteristic property of the resonator, e.g., the mode frequency shift, is discovered to be more sensitive than the changes between values respectively measured in the two equilibrium states. Figure 8 shows measured WGM mode spectra at different times during the transient period after an analyte is introduced to a microsphere cavity coated with Streptavidin. The measurements are taken from 90s to 330s by an interval of 30s after the analyte is introduced. This frequency shift can then used to extract the information of the analyte.

10. Claim 1 is rejected under 35 U.S.C. 102(e) as being clearly anticipated by Hunziker (US 6,583,399). In the patent Hunziker teaches an optically based resonating sensor useful for detecting and discriminating specified substances present in the environment is provided. The resonating sensor comprises a light source and a coupler adapted to allow light to pass from the light source to a resonator wherein the light is stored for a specified period of time. The resonator is coupled to the coupler such that some portion of the light passing through the coupler enters the resonator and some portion of the light resonating within the resonator exits the resonator to the coupler. The outer surface of the resonator is modified such that the interaction of the modified outer surface of the resonator with a specified substance in the environment alters some characteristic of the light flowing through the sensor system. A detector is arranged to observe and detect the interactions between the modified outer surface and the light flowing through the system.

11. Claim 1 is rejected under 35 U.S.C. 102(a) as being clearly anticipated by Vollmer (Applied Physics Letters May 2002). In the paper Vollmer teaches protein detection by optical shift of a resonant microcavity. An optical biosensor with unprecedented sensitivity for detection of unlabeled molecules is presented. The device uses optical resonances in a dielectric microparticle (whispering gallery modes) as the physical transducing mechanism. The resonances are excited by evanescent coupling to an eroded optical fiber and detected as dips in the light intensity transmitted through the fiber at different wavelengths. Binding of proteins on the microparticle surface is measured from a shift in resonance wavelength. They demonstrate

the sensitivity of the device by measuring adsorption of bovine serum albumin and show its use as a biosensor by detecting streptavidin binding to biotin.

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additionally cited art relates to microcavity resonators operated in whispering-gallery mode.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose telephone number is (571) 272-1265. The examiner can normally be reached on Monday-Thursday and Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Arlen Soderquist/
Primary Examiner, Art Unit 1797